CXVB/CXV-T All Weather Operation

Simply the Best Condensers in the Market

By utilizing BAC's patented Advanced Coil and Combined Flow Technologies, the CXVB and CXV-T units provide value to the installing contractor and the owner, delivering the lowest energy consumption, lowest refrigerant charge, and lowest installation costs possible.

Advantages of Running the CXVB/T Wet in Winter / Freezing Conditions

- **Operational energy cost savings** by running the condenser wet with fans off, instead of running a conventional evaporative condenser dry with fans on.
- **First cost savings** by eliminating the need to fin condenser coils, a requirement in other conventional condenser designs to meet capacity running dry with fans on.
- With the fan motors and blades in the exiting warm air stream, the CXVB/CXV-T condensers do not have icing problems seen in conventional evaporative condenser designs. In a conventional condenser icing can lead to catastrophic fan failures. With the CXVB/CXV-T the customer's **total cost of ownership is potentially reduced** due to less operational downtime and loss of productivity.
- To further **decrease the chance of freezing**, the blank-off sides of either the CXVB or CXV-T can be oriented to face prevailing wind direction, compared to other induced draft condensers with four sided air inlet louvers.
- When the proper sequence of operation (see "How to Operate the CXVB/CXV-T in Freezing Conditions" below) is followed, the spray water temperature stays well above freezing thereby **eliminating ice formation on the coil and fill**.

How to Operate the CXVB/CXV-T in Freezing Conditions

Constant Load

Maintain condensing temperature at 70˚F or at a minimum temperature desired by the system designer for hot gas defrost. As load decreases use VFDs on the fan(s) to accomplish this (Operating Band 1, **Figure 1** on **page 2**).

Variable Load

As Load Decreases from Full Load to Low Load

- Maintain condensing temperature at 70°F or at a minimum temperature desired by the system designer for hot gas defrost. As load drops use VFDs on fan(s) to maintain set condensing temperature (Operating Band 1, **Figure 1 on page 2**).
- With a further drop in load, in a multi-fan unit, turn off individual fans to match load. Use the VFDs on the others. If the system has a flood back valve, it can be used to back up refrigerant in the condenser to maintain minimum condensing temperature (Operating Band II, **Figure 1** on **page 2**).

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- Once the load drops to a point where maintaining minimum condensing temperature is not possible with VFDs alone, switch off the fans and run the condenser wet (Operating Band III, **Figure 1**).
- As a last step run the condenser dry. Once pump(s) are off, allow enough time for water to drain down to the sump before switching the fans on. This prevents freezing in the fill (Operating Band IV, **Figure 1**).

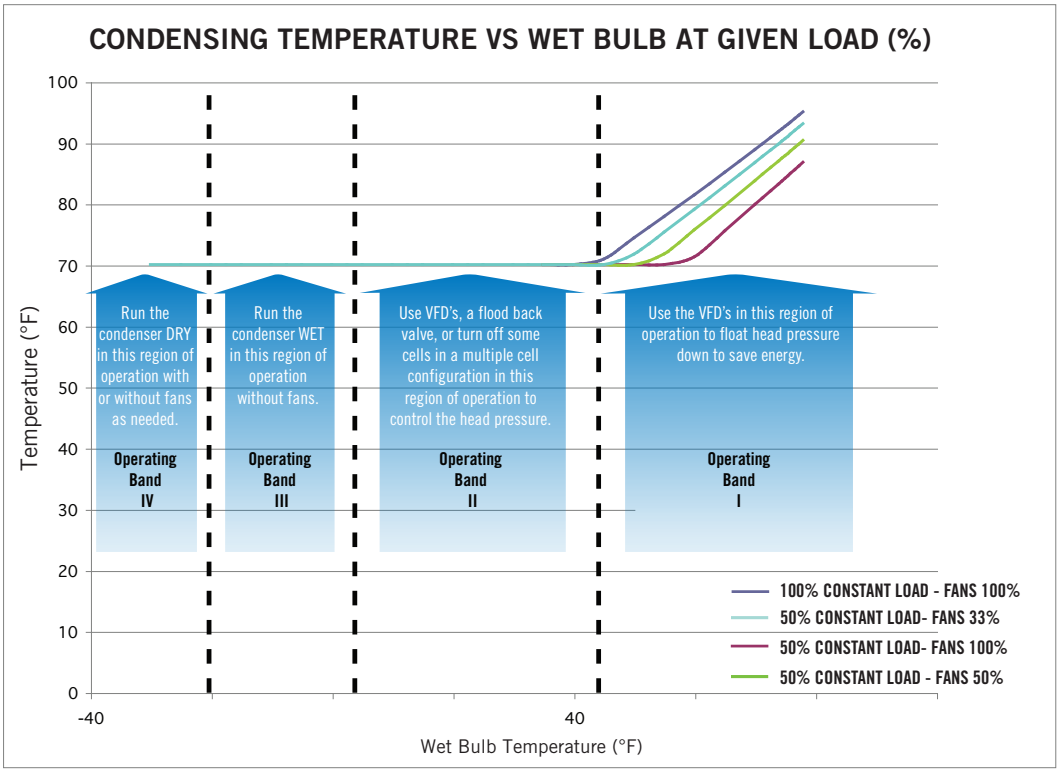

Figure 1. Condensing Temperature as a Function of Wet-bulb Temperature at Various Load Conditions

As the Load Increases from Low to Full Load

- When operating dry, as the load increases, ramp up VFDs on the fans to match the load (Operating Band IV, **Figure 1**).
- With a further increase in the load, shut the fans off, and allow the condenser to stabilize before turning the pump back on in below freezing conditions. Once the pump has been running for a few minutes and the water gets warm and reaches steady state, further increase in the load can be satisfied by turning the fans on and ramping up VFDs. This dwell time is very important to prevent freezing on the fill (Operating Band III and II, **Figure 1**).
- As the load increases in a multiple fans unit, turn on individual fans and ramp the VFDs as needed to match the load. If there is a flood back valve, open it fully to use the full condenser (Operating Band III and II, **Figure 1**).

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Design Recommendations When Using CXVB/CXV-T Condensers in Freezing Climates

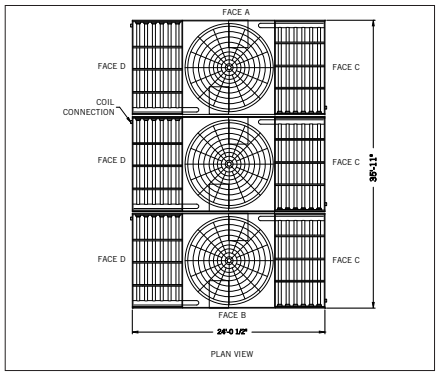
- Heat trace all water and electrical equipment, plus utilize a basin heater or remote sump.
- Use multiple condensers or multi-cell unit(s) to achieve optimal energy efficiency and flexibility.
- When designing a system, always size the smallest compressor to handle minimum loads (envelope, infiltration, minimum lighting and equipment loads). This allows the compressor to run year round, and provides hot gas needed for defrost, and any valves that are gas operated (such as suction stop valves which require hot gas during refrigeration).
- If the condenser has multiple fans, use individual fan motors with VFDs.

Sample Project 1: Using Multiple Condensers to Match the Load

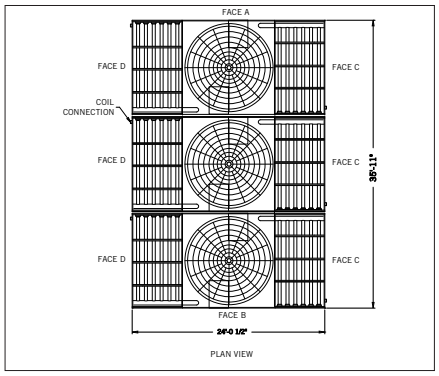
Load: 32,000 MBH **Condensing Temperature:** 95˚F **Design Wet Bulb:** 78˚F

Solution: Nine CXV-T 792-S condensers arranged as three 24’ x 36’ banks (as shown below)

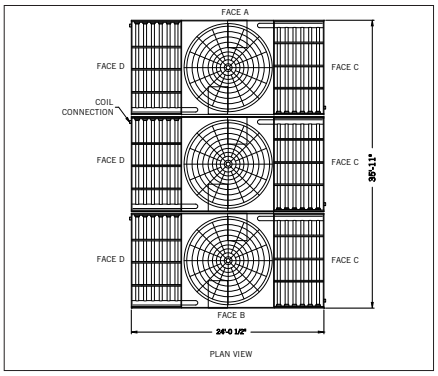
Total Fan HP: 450 HP **Project Location:** Ontario, Canada



Bank 1



Bank 2



Bank 3

NOTE: Each bank is capable of 33.33%. Each cell in a bank is capable of 1/9th of total full load (11.11% of total load). With the VFD set at minimum, a single cell can meet 1% of the total load. This means that any % of the total load can be achieved with the 3 banks! This also means that **condensers can be run wet throughout the year, save on fan HP, and total energy.**

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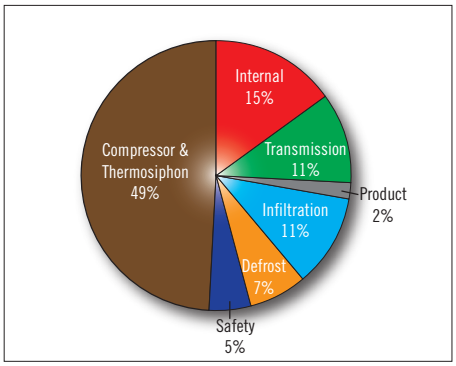
Sample Project 2: Cold Storage Warehouse

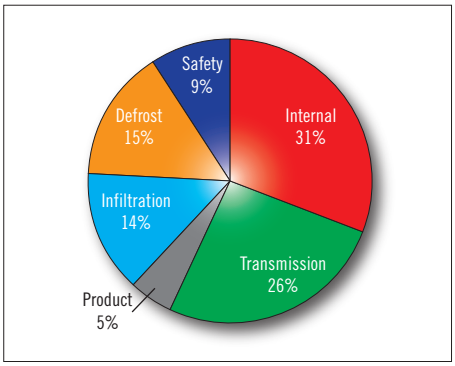
	Internal		Transmission		Product		Infiltration		Defrost		Safety		Compressor/ Thermosiphon
	% Total Load	BTU	% Total Load	BTU	% Total Load	BTU	% Total Load	BTU	% Total Load	BTU	% Total Load	BTU	
-25˚F Freezer	32	314,880	24	236,160	8	78,720	12	118,080	15	147,600	9	88,560	
-10˚F/+28 Freezer	31	257,424	26	215,904	5	41,520	14	116,256	15	124,560	9	74,736	
-10˚F/+28 Freezer	31	257,424	26	215,904	5	41,520	14	116,256	15	124,560	9	74,736	
+40 Dock	22	190,344	15	129,780	0	0	47	406,644	7	60,564	9	77,868	
Total	**15**	**1,020,072**	**11**	**797,748**	**2**	**161,760**	**11**	**757,236**	**7**	**457,284**	**5**	**315,900**	**49%**

Table 1. Load Calculations

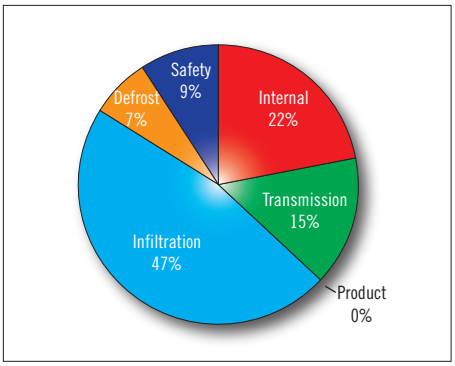
As can be seen from the chart "Load Distribution as Seen at Condenser" below, a major portion of the load comes from heat of compression and thermosiphon oil cooling (25-50%) depending on the facility. Transmission and infiltration loads can add up to another 22%. This means that in most cases the low load condition will be between 50%-75% of full load condition. This allows the condenser to be run wet while keeping spray water temperatures well above freezing and saves fan energy. This sample project is a facility with 3-stage compression.



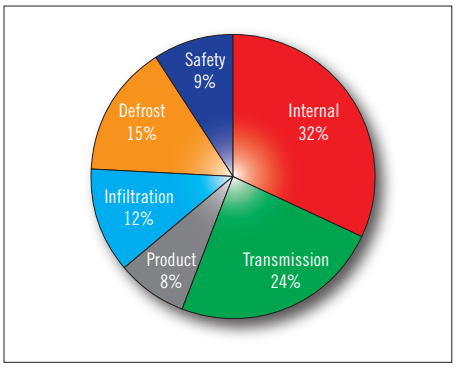
Load Distribution as Seen at Condenser



-10˚F Freezer Load



Dock Load



-25˚F Freezer Load

DON'T FORGET OTHER ADVANTAGES OF THE CXVB AND CXV-T:

- 2 sided connections allow for a single bank of multiple condensers to meet any load requirement
- Less weight: save on rigging and building steel
- Lowest fan horsepower
- Lowest charge
- Easy access to fan and drives from the inside

Questions? Contact your local BAC representative to use this energy saving, low charge, light weight, easy to maintain condenser.

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